# METHOD AND APPARATUS FOR AUTOMATIC PREREQUISITE VERIFICATION AND INSTALLATION OF SOFTWARE

## BACKGROUND OF THE INVENTION

### 1. Technical Field:

The present invention relates generally to a method of installing software on a computer. More specifically, the present invention is directed toward a method of automatically downloading, installing, and configuring software on one or more target systems in a network.

### 2. Description of Related Art:

Internet, also referred to as an "internetwork," in communications is a set of computer networks, possibly dissimilar, joined together by means of gateways that handle data transfer and the conversion of messages from the sending network to the protocols used by the receiving network (with packets if necessary). When capitalized, the term "Internet" refers to the collection of networks and gateways that use the TCP/IP suite of protocols.

The Internet has become a cultural fixture as a source of both information and entertainment. Many businesses are creating Internet sites as an integral part of their marketing efforts, informing consumers of the products or services offered by the business or providing other information seeking to engender brand loyalty. Many federal, state, and local government agencies are also employing Internet sites for informational purposes, particularly agencies that must interact with virtually all segments of society such as the Internal Revenue Service and secretaries of state. Operating costs may be reduced by providing informational guides and/or searchable databases of public records online.

Currently, the most commonly employed method of transferring data over the Internet is to employ the World Wide Web environment, also called simply "the web." Other Internet resources exist for transferring information, such as File Transfer Protocol (FTP) and Gopher, but have not achieved the popularity of the web. In the web environment, servers and clients effect data transaction using the Hypertext Transfer Protocol (HTTP), a known protocol for handling the transfer of various data files (e.g., text, still graphic images, audio, motion video, etc.). Information is formatted for presentation to a user by a standard page description language, the Hypertext Markup Language (HTML). In addition to basic presentation formatting, HTML allows developers to specify "links" to other web resources identified by a Uniform Resource Locator (URL). A URL is a special syntax identifier defining a communications path to specific information. Each logical block of information accessible to a client, called a "page" or a "web page," is identified by a URL. The URL provides a universal, consistent method for finding and accessing this information by the web "browser." A browser is a program capable of submitting a request for information identified by a URL at the client machine. Retrieval of information on the web is generally accomplished with an HTML-compatible browser, such as, for example, Netscape Communicator, which is available from Netscape Communications Corporation.

When a user desires to retrieve a document, such as a web page, a request is submitted to a server connected to a client computer at which the user is located and may be handled by a series of servers to effect retrieval of the requested information. The selection of a document is typically performed by the user selecting a hypertext link. The hypertext link is typically displayed by the browser on a client as a highlighted word or phrase within the document being viewed with the browser. The browser then issues a hypertext transfer protocol (HTTP) request for the requested documents to the server identified by the requested document's URL. The server then returns the requested document to the client

browser using the HTTP. The information in the document is provided to the client in which the document is formatted according to HTML. Typically, browsers on personal computers (PCs) along with workstations are used to access the Internet. The standard HTML syntax of Web pages and the standard communication protocol (HTTP) supported by the World Wide Web guarantee that any browser can communicate with any web server.

In addition to providing a medium for transmitting documents as hypertext, the World Wide Web can also function as a user interface to a remote computer system. For instance, some retail web sites, such as "amazon.com" provide an interface to a product-ordering system, so that customers can order products online. Other websites, such as "download.com," allow users to download program files to install onto their computer systems.

Once a program has been downloaded from a website, however, it must usually be installed in some fashion. Installation of a computer program refers to a process of preparing the program to be executed on a particular computer system. Program installation may include such steps as decompressing or copying files and setting configuration options. Before installing a program, a user must verify that all hardware and software prerequisites for the program are available on the target computer. If these prerequisites are not available then a user must install the necessary prerequisites prior to installing the program. If either the prerequisites are not properly installed or the steps for program installation are not performed properly, the program will not execute properly. Depending of the complexity of the program in question, the installation process may be quite involved. This is particularly true of software that must be installed on a large number of computers, such as an institutional network of computers.

What is needed, then, is a technique for simplifying the installation of downloaded software on one or more computer systems.

## SUMMARY OF THE INVENTION

The present invention provides a technique for automatically installing software on one or more network-connected computer systems. A user submits a request to a server through a web-based interface. In response to the request, the server schedules an installation of the software. At the appropriate time, agents residing on the installation target computers collect information about the target computers. This information is used to download and install the proper version of the software, as well as any prerequisite software packages to be installed with the software. The agents then use the collected information to set configuration options for the installed software. When the agents complete their task, a confirmation message is relayed to the user via electronic mail or other means such as telephone or pager.

## BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

**Figure 1** is an overview of a hardware configuration in accordance with an embodiment of the present invention;

**Figure 2** is an overview of the process of software installation performed by an embodiment of the present invention;

**Figure 3** is a diagram of a website in accordance with an embodiment of the present invention;

**Figure 4** is a diagram of a login page of a website in accordance with an embodiment of the present invention;

**Figure 5** is a diagram of a menu page for selecting a software title from a website in accordance with an embodiment of the present invention;

**Figure 6** is a diagram of a product description page of a website in accordance with an embodiment of the present invention;

**Figure 7** is a diagram of a menu page for selecting target computers from a website in accordance with an embodiment of the present invention;

**Figure 8** is a diagram of a installation agent download page from a website in accordance with an embodiment of the present invention;

**Figure 9** is a flowchart representation of the operation of a server receiving customer requests in accordance with an embodiment of the present invention;

**Figure 10** is a flowchart representation of the operation of a server directing a

scheduled installation process in accordance with an embodiment of the present invention; and

**Figure 11** is a flowchart representation of the operation of a software installation agent in accordance with an embodiment of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

**Figure 1** depicts an overview of a collection **100** of computer systems connected to an Internet **105** and configured to operate in accordance with an embodiment of the present invention. Client computer **110**, under the direction of a user, enters into communication with server **120** through Internet **105**. Alternatively, a wireless network, local area network, wide area network, intranet, or any other form of computer network could be substituted for Internet **105**. Client computer **110** submits a request to server **120** that a particular item of software be installed on target computers **130**, **132**, and **134**. Server **120**, after receiving the request, schedules a time for installing the desired software on target computers **130**, **132**, and **134**. A convenient time might be one very early in the morning, when most of target computers **130**, **132**, and **134** will likely not be in use.

At such scheduled time, server **120** or an alternate server **122** enters into communication with target computers **130**, **132**, and **134** and commences a verification process on each of target computers **130**, **132**, and **134**. The verification process determines whether target computers **130**, **132**, and **134** are capable of executing the desired software. The verification process also determines which version or versions of the software should be installed on each of target computers **130**, **132**, and **134**, what prerequisite software packages must be installed before installing the desired software, and how each copy of the software should be configured to operate on the its respective target computer.

After the verification process has ended, the software and its prerequisite software packages are installed and configured on target computers **130**, **132**, and **134**. After the software has been installed or has been determined to be un-installable on each of target computers **130**, **132**, and **134**, confirmation messages are sent from target computers **130**,

132, and 134 back to server 120 or alternate server 122. Finally, server 120 or the alternative server sends a confirmation message to the user of client computer 110 through electronic mail (E-mail).

Figure 2 provides a more detailed view of the overall operation of an embodiment of the present invention. Client computer 200 sends a request 205 to server 210 to install an item of software on target computers 230, 232, and 234. Although not depicted in Figure 2, the target computers may include client computer 200.

Server 210, at a scheduled time, sends instructions 212, 214, and 216 to target computers 230, 232, and 234. Instructions 212, 214, and 216 are received by software agents 220, 222, and 224, which execute on target computers 230, 232, and 234. Instructions 212, 214, and 216 include information such as what software is to be installed, what the hardware and software prerequisites are for that piece of software, and rules for determining how configuration options should be set for the software.

After receiving instructions 212, 214, and 216, agents 220, 222, and 224 enter into contact with an installation server 240 (which may or may not be the same server as server 210). Agents 220, 222, and 224 collect information that is pertinent to determining whether the software to be installed may be installed and how the software should be installed and configured. In addition, agents 220, 222, and 224 collect information concerning which prerequisite software packages must be installed prior to installing the desired software.

In one possible embodiment, after the information is collected, agents 220, 222, and 224 make a determination as to what version of the software should be installed, what prerequisites are needed to be installed, and how the software should be configured. In an alternative embodiment, the collected information is forwarded to server 240, and server 240 makes the determinations as to versions, prerequisites, and configuration.

After determinations have been made as to versions, prerequisites and

configuration, agents **220**, **222**, and **224** download (**236**, **237**, and **238**) and install the desired software and any prerequisite software packages onto target computers **230**, **232**, and **234**. Agents **220**, **222**, and **224** then configure the installed software to operate properly on target computers **230**, **232**, and **234**.

**Figure 3** demonstrates how a user interface for an embodiment of the present invention may be implemented through an HTML browser window **300**. Users can initiate communication with a server, such as **120** in **Figure 1**, by entering a uniform resource locator (URL) **302** corresponding to the server into the address entry form **303** at the top of the browser window **300**. The main interface is contained in HTML page **305** displayed within browser window **300**, which is loaded from the server. HTML page **305** contains a set of navigational controls **307** to allow the user to move from one displayed HTML page to another.

In this particular embodiment, a "login" control **310** and a "register" control **320** are defined. Login control **310**, when clicked with mouse pointer **315** (using a mouse or similar pointing device), allows a user to access a user account, which may store data about the user's computer systems. This feature allows a user to conveniently install software for an entire network of computers without having to re-identify each computer individually to the server each time. Register control **320** allows a new user of the server to establish a new user account.

In **Figure 4**, when login control **310** is clicked, login page **400** is displayed. The user is prompted to enter a user name in a "username" text field **405**. The user is also prompted to enter a password in a "password" text field **410**. Requiring both a user name and password protects potentially sensitive information about the user's computer systems from discovery by others. To complete the login process, the user clicks on button **420**. Added security protection is provided through encryption of the data transmitted between the user's client computer and the server. This can be accomplished

through the use of Secure Sockets Layer (SSL) technology, which is available in most commonly-used HTML browsers today. A locked padlock icon **425** in the lower-left corner of browser window **300** signifies that encryption is being used.

In **Figure 5**, after the user has logged in, the user may select from a menu **500** an item of software to be previewed or installed. The user highlights a choice **510** by clicking on choice **512** with the mouse or other pointing device. The user then clicks a submit button **520** to continue. In an alternative embodiment, more than one software title may be selected.

In **Figure 6**, after an appropriate title has been selected, a preview page **600** is displayed within browser window **300**. The preview page provides information about the software **610** and an ordering link **620**. When the user clicks on link **620** with the mouse or other pointing device, the user signifies that the program in question is to be installed on one or more of the user's computer systems.

In **Figure 7**, after the user has opted to install the item of software, the user is given an opportunity to specify which target computers the software should be installed on. Because the user in **Figure 7** has already logged into the user's account, a menu **700** of computers owned or under the control of the user is displayed. In an alternative embodiment or in the case that a user has not logged in, the user may be prompted to provide identifying information about the computer onto which the software is to be installed, rather being provided with a menu of choices. In the embodiment in **Figure 7**, however, the user selects the proper target computers by clicking on appropriate choices **710** to highlight them, then clicking submit button **720** to complete the choice. After the user clicks submit button **720**, the server will schedule an appropriate time to install the software.

In order for the software to be installed on the selected target computers, installation agents must be present and installed on each of the target computers. **Figure**

8 demonstrates that such installation agents may be downloaded using an interface provided by an HTML page **800**, then easily installed by a user. HTML page **800** contains a link **805** that, when clicked, begins the process of downloading an executable file containing the installation agent. Status window **810** displays the status of the installation agent executable file that is being downloaded. Once download is complete, the user may execute the executable file to enable the installation agent.

A more convenient alternative to downloading an installation agent would be to bundle the installation agent with some other piece of software, such as an operating system, so that any computer with the other piece of software installed would also have the installation agent installed. This alternative is particularly useful in the context of technical support, where updates to software products must be distributed to users who already have the original product installed.

**Figure 9** is a flowchart representation of the operation of a server in receiving and processing a request from a client computer, in accordance with an embodiment of the present invention. First the server receives the user's choice as to which software is to be installed (step **900**). If the user is logged into a user account, so that information stored on the server about the user's computer systems is available (step **910**), the user is given a list of choices as to which target computers to install the software on (step **920**). The server then receives the user's choices (step **930**).

Next, the user is given the option of downloading the installation agent to install on the target computers prior to downloading (step **940**). The user's choice is then received by the server (step **950**). If the user has opted to download the installation agent (step **960**), then the installation agent is transmitted to the user's client computer (step **970**). Finally, the installation is scheduled (step **980**).

**Figure 10** is a flowchart representation of a server in the process of performing a scheduled installation. First instructions concerning the installation to be performed are

sent to the installation agent or agents on the target computer(s) (step **1000**). Next, the server awaits and receives a response (positive or negative) from each of the target computers (step **1010**). Finally, a confirmation is sent to a user through electronic mail (E-mail) (step **1020**). Alternatively, the confirmation could be sent via some other communication means, such as by telephone or pager.

**Figure 11** is a flowchart representation of the operation of an installation agent written in accordance with an embodiment of the present invention. First, the agent awaits and receives instructions from a server (step **1100**). Pursuant to the instructions, the agent gathers information pertinent to determining the proper version, configuration, and prerequisites (step **1120**). Next, the agent determines whether a combination of software version, configuration, and installed prerequisites exists such that the desired software can be installed (step **1130**). If not, then a response is sent to the server indicating that installation is impossible (step **1140**).

If the software can be installed, then the proper version of the software and the necessary prerequisite software components are downloaded from the server (step **1150**). Next, the proper configuration options for the software are set (step **1160**). Finally, the agent sends a response back to the server to indicate that installation was successful (step **1170**).

One of ordinary skill in the art will appreciate that the present invention is applicable in a number of application domains. One such domain, which was mentioned earlier in passing, is as a distribution means for technical support updates to software. Both application and system software products are oftentimes updated frequently, and the ability to make automatic updates in the manner here described is a tremendous convenience.

Another application domain to which the technology of the present invention is particularly well suited is that of a World-Wide Web based online software store. The

installation server and agent system of the present invention can be coupled to an additional hardware/software system for obtaining payment. The installation server, in such an instance, can charge a user's credit card account or bank account when a successful installation has been performed, and when the installation is not successful, it is possible to allow no charges to accrue. In this way, a customer only pays for what the customer actually receives.

One of ordinary skill in the art will also appreciate that in an embodiment of the present invention, multiple items may ordered for installation at once. The present invention is not limited to installing one item of software at a time. In addition, the commonly used World Wide Web technique of providing users with an online "shopping cart," so that multiple products may be selected one-by-one while browsing, then ordered together at one time, is also applicable to the present invention.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and transmission-type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions. The computer readable media may take the form of coded formats that are decoded for actual use in a particular data processing system.

The description of the present invention has been presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the

invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. Although the depicted illustrations show the mechanism of the present invention embodied on a single server, this mechanism may be distributed through multiple data processing systems. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.